

REMARKS

Claims 1-4, 10 and 11 are all the claims pending in the application. By this amendment, Applicants are canceling claim 7.

Claims 1, 4, 7, 10 and 11 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Nakajima et al. (5,999,345) in view of Kitamura (4,393,387).

Claim 2 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Nakajima et al. (5,999,345) in view of Kitamura (4,393,387), and further in view of Motoi (6,639,719).

Claim 3 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Nakajima et al. (5,999,345) in view of Arimoto et al. (4,806,951).

Alternatively, claims 1, 4, 7, 10 and 11 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Nakajima et al. (5,999,345) in view of Inoue et al. (6,522,350).

Claim 2 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Nakajima et al. (5,999,345) in view of Inoue et al. (6,522,350), and further in view of Motoi (6,639,719).

Analysis

A premise of the present invention is to simultaneously use the plurality of semiconductor laser arrays which include a plurality of independent light emitting points, in order to realize a high-speed and a high dot density writing of the laser beam scanning optical system to use for a laser printer, etc. Since a manufacturing error of array devices, a deviance of arrangement positions of the array devices, and a deviance of a position between scanning beams which is caused by a disturbance and a serial deviance of arrangement must be constantly

corrected, beam intervals are kept in a equal value, and a writing of a high-quality image are stably realized.

Applicants now briefly review the teachings of the cited prior art.

Nakajima discloses that a plurality of semiconductor lasers (semiconductor lasers 101 and 102) are arranged in a single supporting member supporting member 103) to make a light source unit which emits a plurality of laser beams.

In Nakajima, the semiconductor laser that is arranged in the support member emits only a single laser beam in its own right. On the other hand, in the present invention, a semiconductor laser includes a plurality of light emitting points in its own right. Therefore, the structure of Nakajima's semiconductor laser is fundamentally different from that of the present invention.

Further, Nakajima fails to teach or suggest a technical idea that the scanning position of beams are constantly detected and controlled while the apparatus operates.

Kitamura discloses a beam recording apparatus including a monolithic semiconductor laser array. However, Kitamura only discloses a single semiconductor laser array, and fails to disclose that an apparatus includes a plurality of semiconductor laser arrays which include a plurality of light emitting points.

Motoi discloses that a time that two beams pass a detector respectively is detected, and a difference of the time interval between a passage time of the reference beam and that of the other beam is calculated, and a beam interval of two beams on the basis of the calculation is controlled. However, in Motoi, the detector is a particular structure, and has a fault that the structure is complicated.

Arimoto discloses a technology that uses more than one semiconductor laser which emits a single laser beam as disclosed in Nakajima. Therefore, Arimoto is different from the present invention that uses so-called "semiconductor laser array" which includes a plurality of light emitting points.

Inoue relates to an optical writing with a mechanical scanning which uses a plurality of light emitting elements. Inoue only discloses an arrangement angle of light sources to improve an arrangement density of a writing-light-spot. Also, Inoue fails to teach or suggest about an adjustment and control of the light position during job performance.

Turning to claim 1, the Examiner maintains the same rejection based on the combination of Nakajima and Kitamura. In addition, the Examiner now also rejects claim 1 based on the combination of Nakajima and newly cited Inoue.

As discussed above, in Nakajima, the semiconductor laser light source emits only a single laser beam, whereas the present invention utilizes a semiconductor laser light source that includes a plurality of light emitting points. Kitamura suffers from this same deficiency. Therefore, the combination of these references fails to arrive at claim 1. Moreover, the combination of references fail to teach or suggest the concept that each of the semiconductor laser light sources is detected and controlled so that all the beam intervals are kept at a predetermined equal value during the recording operation.

Moreover, Inoue fails to overcome the deficiencies of Nakajima because Inoue merely discloses an arrangement angle of light sources to improve arrangement density of a writing-

light-spot. The combination of references fail to teach or suggest the control of all beam intervals on a scanning surface during recording operation.

In view of the foregoing, Applicants respectfully submit that claim 1 is patentable.

Turning to claim 2, the controller of the present invention detects a difference of the time interval between which two specific beams pass a photo-detector, and controls an inclination angle of the arrayed light source. This concept is not taught or suggested by the combination of cited references. Therefore, Applicants respectfully submit that claim 2 is patentable.

Turning to independent claim 3, the Examiner maintains that this claim is obvious over the combination of Nakajima and Arimoto.

In claim 3, the controller includes detecting means for scanning positions of a reference beam which is specified respectively from a plurality of output beams out of the laser sources. As mentioned above, Nakajima fails to disclose a semiconductor laser light source having a plurality of light emitting devices arranged in a line at equal intervals. Moreover, Nakajima fails to disclose a controller which includes detecting means for scanning positions of a reference beam specified respectively from outputs beams out of each of the laser light sources. Moreover, there is no disclosure for keeping the beam interval at a predetermined value during recording operation. Arimoto fails to overcome the deficiencies of Nakajima because Arimoto also fails to disclose a semiconductor laser array, which includes a plurality of light emitting points.

In view of the foregoing, the combination of Nakajima and Arimoto fails to arrive at the claimed invention according to claim 3.

Turning to claim 4, this claim is patentable for similar reasons to claims 1 and 3. Namely, the combination of cited references fails to disclose two semiconductor laser light sources, each including a plurality of light emitting devices arranged in a line at equal intervals, nor a controller for controlling these light emitting devices in the semiconductor laser light sources so that all scanning beam intervals on a recording medium are kept equally in a predetermined value during recording operations.

In view of the foregoing, Applicants respectfully submit that claim 4 is patentable.

Turning to claim 10, the first controller individually adjusts and controls an inclination angle with respect to a beam scanning direction of the first and second semiconductor light sources so that an interval between scanning portions from each of the semiconductor light sources on a scanning surface, which is outputted from each of the arrayed light sources, becomes a predetermined value.

The second controller controls a relative interval distance between reference beams that are specified respectively from the first laser light source and the second laser light source, so that the relative interval distance between the beams on a scanning surface becomes the predetermined value or a multiple of that value.

Since the combination of Nakajima and Kitamura, as well as the combination of Nakajima and Inoue, fail to teach or suggest two separate semiconductor light sources, each including a plurality of light emitting devices, these references fail to arrive at claim 10. Moreover, each pair of references fails to suggest two separate controllers for individually

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controlling an inclination angle and for controlling a relative interval distance, respectively, as outlined above. Thus, claim 10 is patentable.

Turning to claim 11, all intervals of scanning beams that are outputted from each of the two arrayed light sources are equal to each other. As noted above, the cited references fail to teach or suggest such arrayed light sources, and thus, would fail to suggest that their outputted scanning beams should be in equal intervals. Thus, claim 11 is patentable.

Conclusion

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

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